10-18GHz Low Noise, Variable Gain Amplifier

GaAs Monolithic Microwave IC

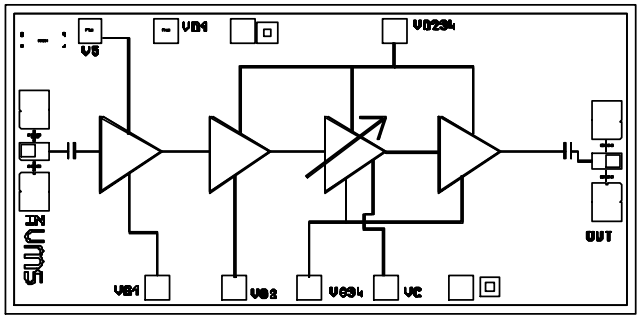
preliminary

Description

The CHA2290 is a high gain four-stage monolithic low noise amplifier with variable gain. It is designed for a wide range of applications, from military to commercial communication systems. The backside of the chip is both RF and DC grounded. This helps to simplify the assembly process.

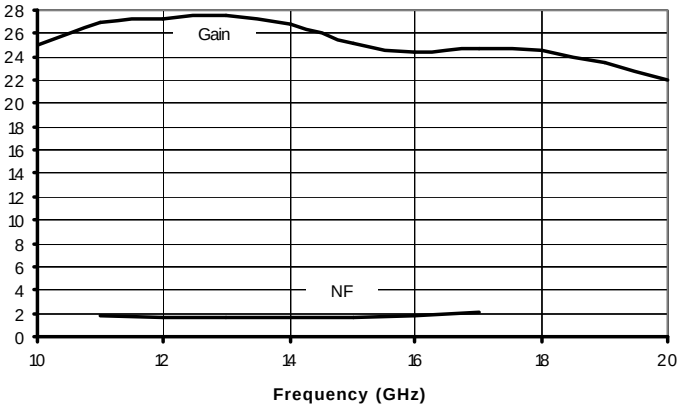
The circuit is manufactured with a PM-HEMT process, 0.25µm gate length, via holes through the substrate, air bridges and electron beam gate lithography.
It is available in chip form.

V5 VD1 VD234



VG1 VG2 VG34 VC

Typical on wafer measurements : Gain & NF



Main Features

- Frequency range : 10 -18GHz
- 2.2dB Noise Figure.
- 25dB gain
- Gain control range: 25dB
- DC power consumption: 180mA @ 5V
- Chip size : 2.49 X 1.23 X 0.10 mm

Main Characteristics

Tamb. = 25°C

	Parameter	Min	Typ	Max	Unit
Fop	Operating frequency range	10		18	GHz
G	Small signal gain		25		dB
NF	Noise figure		2.2		dB
Gctrl	Gain control range with Vc variation		20		dB
Id	Bias current		180		mA

ESD Protection : Electrostatic discharge sensitive device. Observe handling precautions !

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Electrical Characteristics for Broadband Operation

Tamb = +25°C, V5=VD234= 5V

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Symbol	Parameter	Min	Typ	Max	Unit
Fop	Operating frequency range	10		18	GHz
G	Small signal gain (1)		25		dB
ΔG	Small signal gain flatness (1)		±1		dB
Is	Reverse isolation (1)		60		dB
NF	Noise figure with VC = 1.2V 10 - 16 GHz (1) 17 - 18 GHz		2.2 2.5		dB
Gctrl	Gain control range versus VC		25		dB
P1dB	Output power at 1dB compression with VC =1.2V		11		dBm
VSWRin	Input VSWR (1)			3.0:1	
VSWRout	Output VSWR (1)			2.5:1	
Vd	Drain bias voltage V5 = VD234		5		V
VC	Control bias voltage	-1.5	[-0.9, +1.2]	+1.3	V
Id1	First stage Bias current (2) with VC=1.2V		25		mA
Id	Bias current total (3) with VC=1.2V		180		mA

(1)These values are representative of on-wafer measurements that are made without bonding wires at RF ports.
(2) For optimum noise figure, the bias current Id1 should be adjusted to 25mA with VG1 voltage.
(3) With Id1=25mA, adjust VG234 voltage for a total drain current around 180mA.

Absolute Maximum Ratings

Tamb. = 25°C (1)

Symbol	Parameter	Values	Unit
Vd	Maximum Drain bias voltage	+5.25	V
Id	Maximum drain bias current	250	mA
Vg	Gate bias voltage	-2.5 to +0.4	V
Vc	Maximum Control bias voltage	+1.5	V
Vdg	Maximum drain to gate voltage (Vd - Vg)	+5.0	V
Pin	Maximum input power overdrive (2)	-10	dBm
Tch	Maximum channel temperature	+175	°C
Ta	Operating temperature range	-40 to +85	°C
Tstg	Storage temperature range	-55 to +125	°C

(1) Operation of this device above anyone of these parameters may cause permanent damage.
(2) Duration < 1s.

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Typical on wafer Measurements

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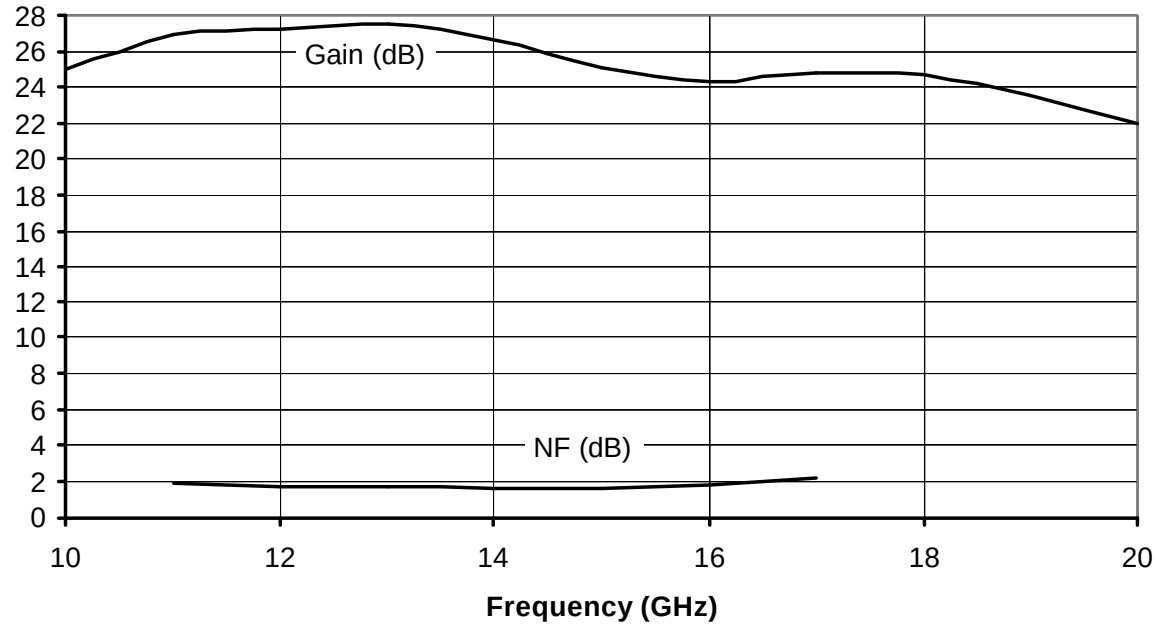
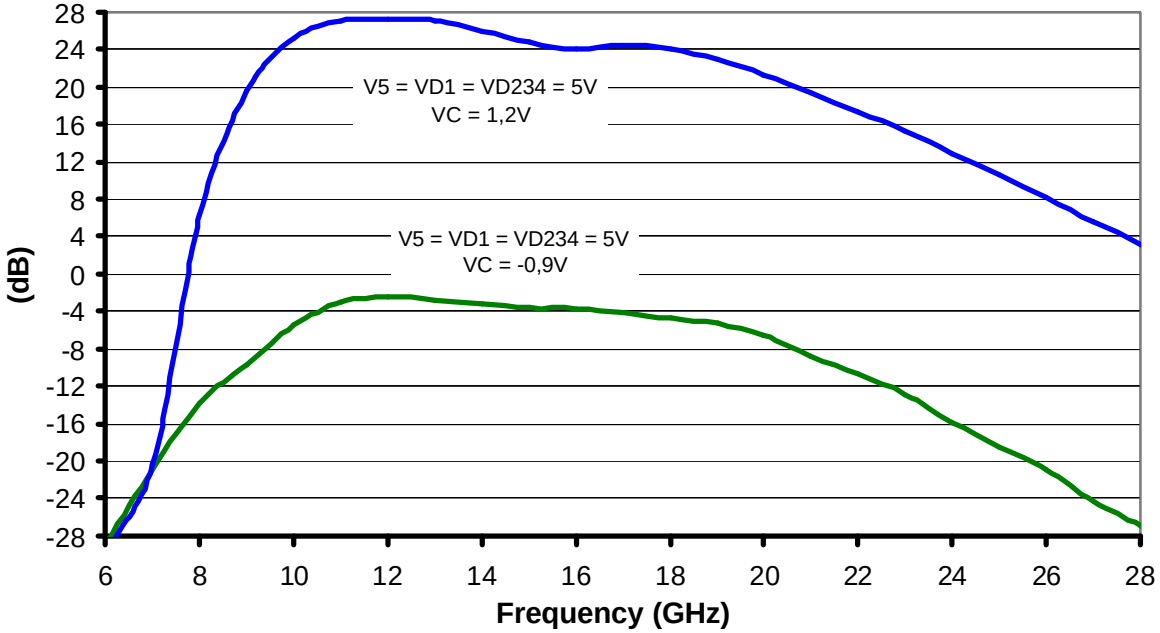
Gain & Noise Figure versus frequency



Bias Conditions : V5=VD234= 5V, VG1 for Id1= 25mA, VG2=VG34= -0.5V, VC= 1.2V

Gain versus frequency and biaising conditions



Common bias Conditions : VG1 = VG2 = VG34 = -0.3V.

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S11 versus frequency and biaising conditions

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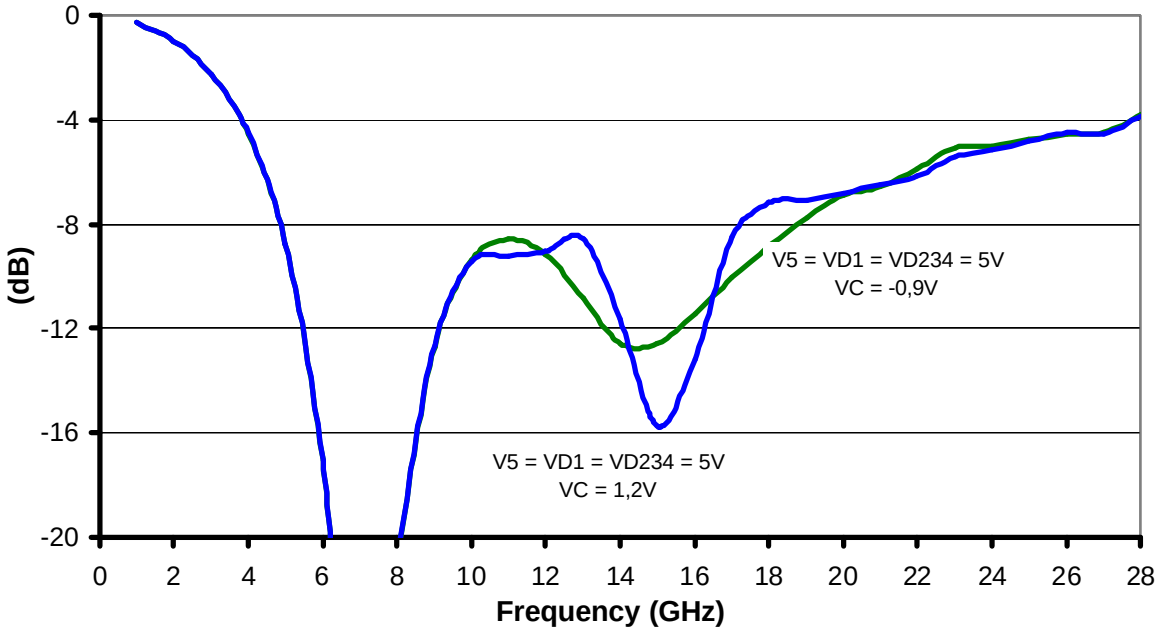
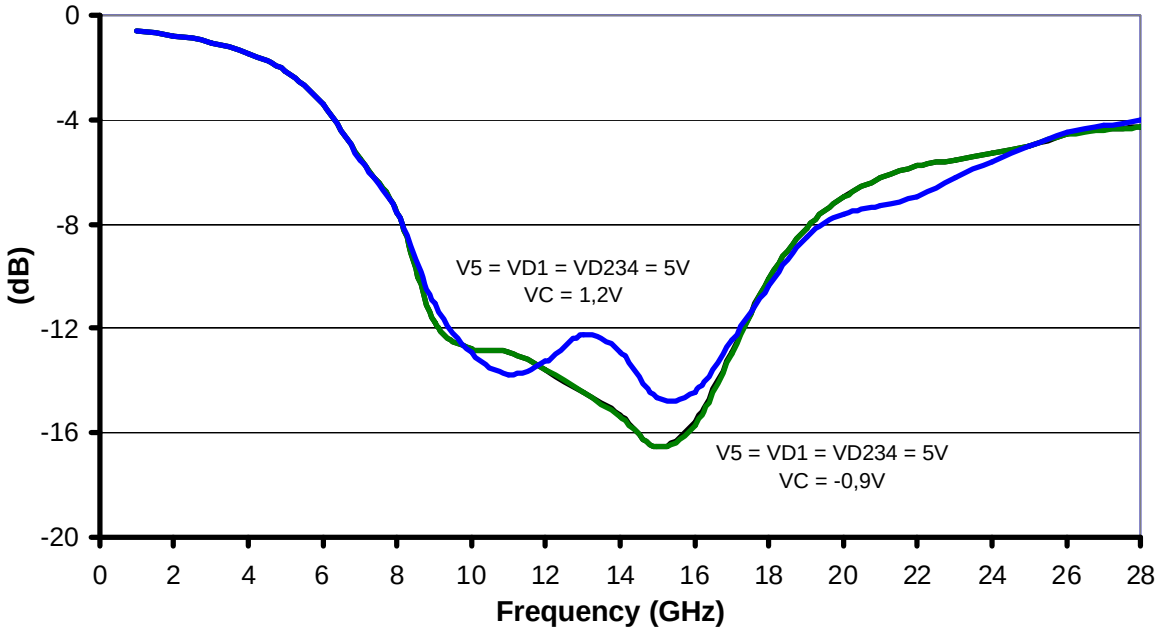


Common bias Conditions : VG1 = VG2 = VG34 = -0.3V.

S22 versus frequency and biaising conditions



Common bias Conditions : VG1 = VG2 = VG34 = -0.3V.

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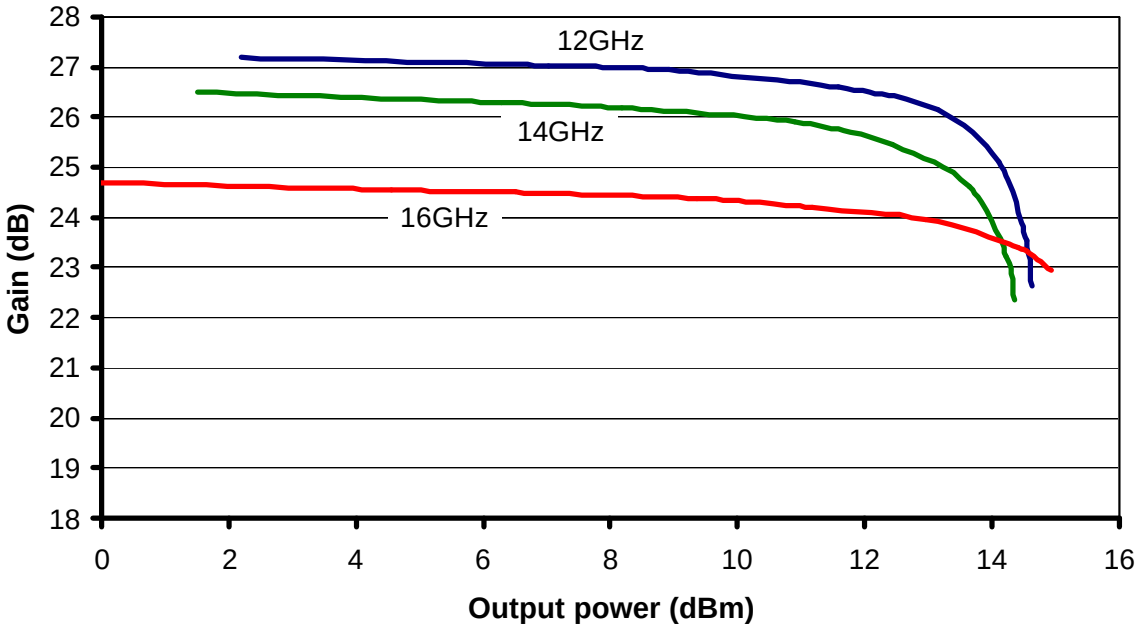
Gain versus Output power



Bias Conditions : V5 = VD234 = 5V, VG1 for Id1 = 25mA, VG2 = VG34 = -0.5V, VC = 1.2V

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Chip Assembly

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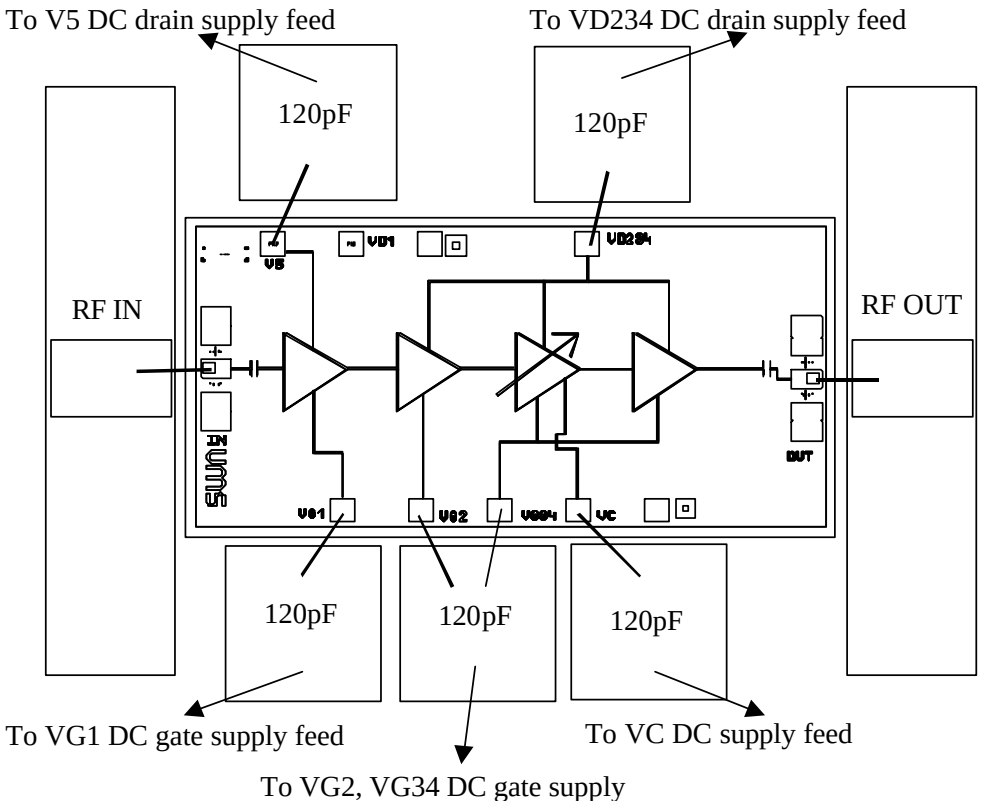

Note : Supply feed should be capacitively bypassed. 25µm diameter gold wire is recommended

Bond Pad: 100 x 100 µm

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Mechanical Data

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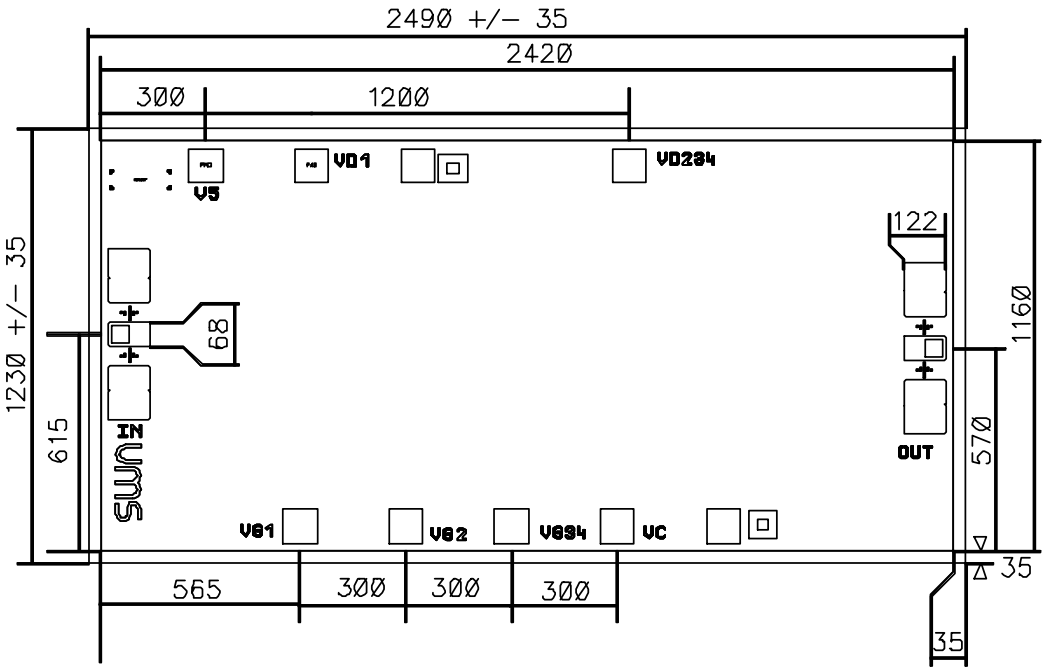

Bonding pad positions

(Chip thickness : 100µm. All dimensions are in micrometers)

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Ordering Information

Chip form : CHA2290-99F/00

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